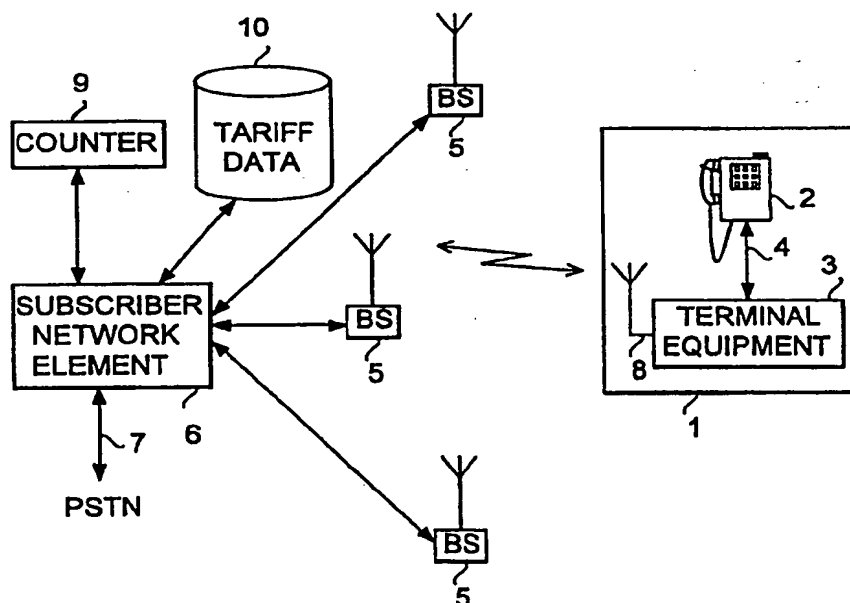




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/FI95/00031 (22) International Filing Date: 23 January 1995 (23.01.95) (30) Priority Data: 940339                      24 January 1994 (24.01.94)                      FI (71) Applicant (for all designated States except US): NOKIA TELECOMMUNICATIONS OY [FI/FI]; Mäkkylän puo- lotie 1, FIN-02600 Espoo (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): SARPOLA, Jussi [FI/FI]; Torikatu 16 B 14, FIN-90100 Oulu (FI). HEIKKILÄ, Vesa [FI/FI]; Kiiminginpolku 13, FIN-90570 Oulu (FI). TASKILA, Ari-Pekka [FI/FI]; Melojantie 1 A 8, FIN- 90560 Oulu (FI). ASUJAMAA, Hannu [FI/FI]; Rysätie 6 A 4, FIN-90550 Oulu (FI). PENTIKÄINEN, Heimo [FI/FI]; Ravanderintie 3 A 3, FIN-90570 Oulu (FI). LIINAMAA, Olli [FI/FI]; Valtatie 77 B 38, FIN-90500 Oulu (FI). RUSI, Pekka [FI/FI]; Nylanderintie 5-7 A 4, FIN-90570 Oulu (FI). VEHMER, Seppo [FI/FI]; Kesantotie 8 E 21, FIN-01630 Vantaa (FI). (74) Agent: OY KOLSTER AB; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. In English translation (filed in Finnish).	

(54) Title: METHOD FOR TRANSMITTING TARIFF DATA TO A SUBSCRIBER UNIT



## (57) Abstract

The invention relates to a method for transmitting tariff data via radio-frequency signals to a chargeable subscriber unit (1) communicating with a telecommunication network (7). In order to charge the user of the subscriber unit as fairly as possible, a tariff frame corresponding to a lump sum is transmitted to the subscriber unit (1), charge-metering signals received from the telecommunication network (7) are counted, and when the monetary value corresponding to the number of the counted charge-metering signals exceeds a predetermined threshold value, a new tariff frame corresponding to a lump sum is transmitted to the subscriber unit (1). The invention also relates to a system where the method according to the invention can be applied.

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## Method for transmitting tariff data to a subscriber unit

5 The invention relates to a method for transmitting tariff data via radio-frequency signals to a chargeable subscriber unit communicating with a telecommunication network. The invention also relates to a radio system providing a wireless local loop, the system comprising at least one base station, a subscriber network element and subscriber units, the  
10 subscriber network element comprising means for transmitting telecommunication signals between the telecommunication system and the subscriber units.

The invention relates to transmitting tariff data via radio signals to a chargeable subscriber unit, such as a pay phone, connected to a telecommunication network. The invention relates in particular to a WLL system, i.e. a radio system providing a wireless local loop, in which system the subscriber units are connected with a radio connection via base stations to a public  
15 switched telephone network (PSTN). Any conventional type of telephone set can be connected to the WLL system by means of a special terminal equipment, the radio path being thus invisible for the user.

In this connection, a subscriber unit refers to the equipment the subscriber has for transmitting and receiving telecommunication signals, i.e. in case of the WLL system, the subscriber unit comprises a WLL terminal equipment consisting of a radio part and a teleadapter (to which the user interface, e.g. a telephone, is  
25 connected), and a user interface, such as a telephone, a telefax terminal, a computer/modem combination or the like, connected to the terminal equipment. In this connection, a chargeable subscriber unit refers to a subscriber unit which charges the user a fee immediately  
30 during the use, and in most cases at least partly in  
35

advance. This kind of chargeable subscriber units are for example those which comprise user interfaces, such as pay phones or telefax terminals, operated by coins, credit cards or other similar means of payment.

5           When chargeable subscriber units are used, the system has to be able to charge the user of the subscriber unit during the use. An arrangement used with the chargeable telephone sets of for example the NMT-450  
10       system is previously known. In this arrangement a tariff frame is transmitted via a radio path to the pay phone when the connection is established, and the phone charges the user of the phone on the basis of this tariff frame independently during the entire call. One drawback of this known arrangement is, however, that  
15       tariff changes possibly occurring during the call cannot be taken into consideration. It is common that the operator determines for example a special evening tariff, which may differ considerably from the day-time tariff. However, the known arrangement described above  
20       cannot take into consideration the possible change of the tariff during the call, wherefore the user of the pay phone may have to pay for the call considerably more (or less) than what the operator actually considers to be the correct price for the call. In other words, the  
25       price of the call calculated by the telephone exchange may considerably differ from the amount of money the pay phone charges the user.

          The purpose of the present invention is to solve the aforementioned problem and to provide a method  
30       for transmitting tariff data to a chargeable subscriber unit in such a way that the user of the unit could be charged as fairly as possible. These aims are achieved with the method according to the invention, which is characterized in that a tariff frame corresponding to  
35       a lump sum is transmitted to the subscriber unit,

charge-metering signals received from the tele-  
communication network are counted, and when the monetary  
value corresponding to the number of the counted charge-  
metering signals exceeds a predetermined threshold  
5 value, a new tariff frame corresponding to a lump sum  
is transmitted to the subscriber unit.

The invention is based on the idea that the use  
of a chargeable subscriber unit can be charged in as  
fair and functional a manner as possible when the  
10 charging is based during the entire connection on  
charge-metering pulses obtained from the tele-  
communication network, i.e. preferably from the phone  
network, and when the user is always charged in advance  
a lump sum corresponding to a certain number of the  
15 pulses. The most important advantage of the method  
according to the invention is that the tariff changes  
may be taken into account also in calls which are going  
on at the moment the tariffs are changed, since the  
tariff frame is repeatedly transmitted to the pay phone  
20 during the entire call, whereupon the tariff frame to  
be transmitted can be changed to another tariff frame  
with a different fee at the moment of tariff-changing  
determined by the operator.

In the method according to the invention, the  
25 operator can determine, separately for each case, the  
lump sum that the user has to pay for each transmitted  
tariff frame. This is highly significant for the quality  
of the call, since each tariff frame transmitted via the  
radio path during the call causes an interruption in the  
30 speech path, and therefore the higher the sums of money  
the user is charged each time, i.e. the more seldom the  
tariff frame is transmitted, the better the quality of  
the call naturally is.

The invention also relates to a system where  
35 the method according to the invention can be applied.

The system according to the invention is characterized in that the system comprises at least one chargeable subscriber unit, a counter arranged in connection with the subscriber network element to count the charge-metering signals transmitted by the telecommunication system, a memory device arranged in connection with the subscriber network element to indicate the tariff frame corresponding to the set of numbers dialled by the chargeable subscriber unit, the subscriber network element comprising means, responsive to the counter, arranged to retrieve from the memory device the tariff frame to be transmitted to the chargeable subscriber unit when the connection is established and when the monetary value corresponding to the number of the charge-metering signals counted by the counter exceeds a predetermined threshold value.

The preferred embodiments of the method and the system according to the invention are disclosed in the appended dependent claims 2, 3, and 5 to 7.

In the following, the invention will be described by means of its first preferred embodiment with reference to the accompanying figure, which is a block diagram of a part of a WLL system where the method according to the invention can be applied. The figure shows a chargeable subscriber unit 1 of the WLL system, the unit comprising a pay phone 2, i.e. a coin-operated telephone, and a terminal equipment 3. The pay phone 2 shown in the figure is an ordinary pay phone which can be connected to the public telephone network by means of a two-wire lead and operated with metering pulses of 12 kHz or 16 kHz. Instead of the phone 2, the system shown in the figure could equally well employ some other ordinary user interface, for example a telefax terminal operated by coins, credit cards or other similar means

of payment, connected to the public phone network by means of a two-wire lead.

The pay phone 2 and the terminal equipment 3 are connected in the figure by a two-wire lead 4, through which telecommunication signals can be transmitted between the terminal equipment and the phone. The terminal equipment 3 comprises signal-processing means for adapting a speech path to a radio channel. Such signal-processing means are e.g. a radio part comprising an antenna 8, a radio transmitter and a radio receiver, and a teleadapter, which adapts the radio part to an ordinary telephone set 2.

The subscriber unit 1 is connected by radio-frequency signals via the antenna 8 to a base station 5 (the figure shows three base stations BS), through which the calls are transmitted, via a subscriber network element 6, to the public switched telephone network (PSTN), i.e. to the fixed telephone network 7. The base stations 5 correspond to the parts of the NMT-450 cellular radio system (Nordisk Mobil Telefon). As far as signalling is concerned, the subscriber unit 1 operates like a normal mobile phone of the NMT-450 system.

For the purpose of charging the user of the pay phone 2 for the phone services he has used, a counter 9 and a tariff frame database 10 are provided to the subscriber network element 6 shown in the figure. In the beginning of a call made from the pay phone 2, the base station controller 6 retrieves from the database 10, on the basis of the dialled phone number, a tariff frame Q1Q2 which corresponds to the tariff determined by the operator for that particular area code. The content and the meaning of the tariff frames Q1Q2 to be used are defined for example in the specifications of the NMT-450 system, according to which they may contain both

price/second data and such price data which corresponds to a lump sum and which can be used according to the invention (i.e. price/transmitted frame).

5 Immediately in the beginning of a call made from the pay phone 2, the subscriber network element 6 retrieves from the tariff frame database 10 the tariff frame Q1Q2 on the basis of the set of numbers and the time (day/evening tariff), and transmits the frame through the base station 5 via a radio path to the subscriber unit 1. After this, the counter 9 begins counting the charge-metering pulses transmitted from the PSTN. When the monetary value corresponding to the number of the pulses exceeds a certain predetermined sum, which is preferably the same as the lump sum  
10 corresponding to the value of the transmitted tariff frame, the subscriber network element 6 retrieves again a tariff frame Q1Q2 from the tariff frame database 10 on the basis of the set of numbers and the time, and transmits the frame to the subscriber unit 1. The latter  
15 tariff frame to be transmitted may thus be the same as or different from the tariff frame transmitted first, depending on whether the tariff used has changed or remained the same (day/evening tariff).  
20

The terminal equipment 3 included in the subscriber unit 1 comprises a signal generator, by means  
25 of which the terminal equipment can simulate the metering pulses of 12 or 16 kHz generally used in the PSTNs. After the terminal equipment 3 has received the tariff frame Q1Q2 transmitted via the base station 5, it generates an amount of metering pulses depending on  
30 the amount of the tariff and transmits these pulses via a two-wire lead 4 to the pay phone 2. The pay phone in turn immediately charges the user on the basis of the number of the pulses it has received. The user of the  
35 pay phone 2 is thus always charged in advance the lump



sum determined by the operator. The operator determines the amount of the lump sum by changing the values in the tariff frame database 10.

5 It must be understood that the above specification and the figure related thereto are only meant to illustrate one preferred embodiment of the method and the system according to the invention without restricting the invention itself thereto. Thus the method according to the invention can naturally be  
10 applied also in other system besides the WLL systems, for example in some cellular radio system. Therefore the preferred embodiments of the method and the system according to the invention may vary within the scope of the appended claims.

## Claims:

1. A method for transmitting tariff data via radio-frequency signals to a chargeable subscriber unit  
5 (1) communicating with a telecommunication network (7), characterized in that

a tariff frame corresponding to a lump sum is transmitted to the subscriber unit (1),

10 charge-metering signals received from the telecommunication network (7) are counted, and

when the monetary value corresponding to the number of the counted charge-metering signals exceeds a predetermined threshold value, a new tariff frame corresponding to a lump sum is transmitted to the  
15 subscriber unit (1).

2. A method according to claim 1, characterized in that the predetermined threshold value is of the same amount as the tariff frame corresponding to the lump sum.

20 3. A method according to claim 1 or 2, characterized in that said telecommunication network (7) is the public switched telephone network (PSTN), whereupon before the tariff frame is transmitted, the set of numbers dialled by the  
25 subscriber unit (1) is analyzed, after which a tariff frame determined for said set of numbers is selected for transmission.

4. A radio system providing a wireless local loop, the system comprising at least one base station  
30 (5), a subscriber network element (6) and subscriber units, the subscriber network element (6) comprising means for transmitting telecommunication signals between the telecommunication system and the subscriber units, characterized in that the system comprises  
35 at least one chargeable subscriber unit (1),

a counter (9) arranged in connection with the subscriber network element (6) to count the charge-metering signals transmitted by the telecommunication system,

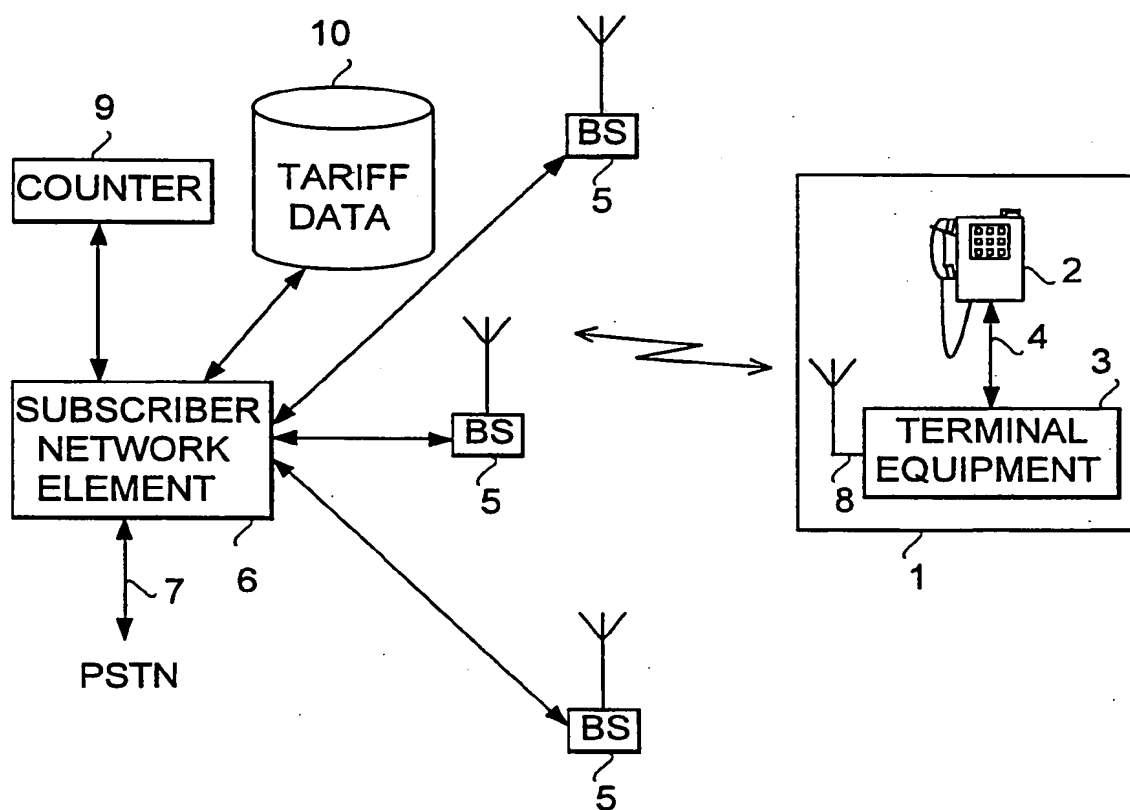
5 a memory device (10) arranged in connection with the subscriber network element (6) to indicate the tariff frame corresponding to the set of numbers dialled by the chargeable subscriber unit, the subscriber network element (6) comprising means, responsive to the counter (9), arranged to retrieve from the memory device the tariff frame to be transmitted to the chargeable subscriber unit (1) when the connection is established and when the monetary value corresponding to the number of the charge-metering signals counted by the counter 10 (9) exceeds a predetermined threshold value.

15 5. A system according to claim 4, characterized in that said telecommunication system is the public switched telephone network (PSTN).

20 6. A system according to claim 4 or 5, characterized in that the terminal equipment (3) of the chargeable subscriber unit (1) comprises a signal generator responsive to the tariff frame transmitted to the subscriber unit, for generating metering signals and for feeding them to a user interface (2), the number of the metering signals to be 25 generated depending on the transmitted tariff frame.

30 7. A system according to claim 6, characterized in that said user interface (2) is a pay phone operated by coins, credit cards or other similar means of payment.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 95/00031

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC6: H04Q 7/22 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: H04Q, H04M		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 9206549 (MOTOROLA INC.), 16 April 1992 (16.04.92), page 5, line 32 - page 6, line 4; page 7, line 8 - line 31; page 11, line 22 - page 12, line 6, page 12, line 34 - page 13, line 2, page 13, line 30 - line 34, page 15, line 27 - page 16, line 2	1,2,4-7
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Y	--	3
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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03/05/95

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